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Description of a new coccid (Hemiptera, Coccidae) on avocado (*Persea americana* Mill.) from Colombia, South America

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Abstract

A new soft scale insect, *Bombacoccus aguacatae* Kondo, **gen. n.** and **sp. n.** (Hemiptera: Coccidae) collected on the branches and twigs of avocado, *Persea americana* Mill. (Lauraceae) in Colombia, is described and illustrated based on the adult female. An updated taxonomic key to closely related genera of the *Toumeyella*-group is provided.

Keywords

soft scale insect, coccid, taxonomy, new genus, new speciess

Introduction

In the last 10 years, nineteen species of scale insects have been described for Colombia. Two of these species, *Laurencella colombiana* Foldi and Watson (2001) (Monophlebidae) and *Akermes colombiensis* Kondo and Williams (2004) (Coccidae) were reported on avocados. *Laurencella colombiana* is a giant monophlebid collected in the municipality of Villamaría, in the State of Caldas, Colombia, where it is regarded as a pest of avocado because it causes dieback of branches and a significant reduction in produc-

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tivity and fruit quality (Foldi and Watson 2001). *Akermes colombiensis* is a polyphagous soft scale insect recorded on avocado (Lauraceae), guava (Myrtaceae), a shrub of the family Melastomataceae and *Ocotea* sp. (Lauraceae) in Valle del Cauca, Colombia (Kondo and Williams 2004). The avocado tree on which *A. colombiensis* was collected has been cut down, and this species has not been collected on avocados since (T. Kondo, personal observation).

On April 2007, an interesting soft scale insect that produces a cottony wax cover was reported in Anserma, Caldas, Colombia, on avocados (A.A. Ramos-Portilla, pers. comm.). The author was able to visit the farm where the insect was originally collected and obtained specimens of this coccid on April 2, 2009. During this visit, the author noted that the avocado trees were affected by sooty moulds which grew on the coccids' honeydew. After studying the microscopic features of this coccid, it was determined that it was a species new to science and belonged to the *Toumeyella*-group, a group currently included in the subfamily Myzolecaniinae (Kondo and Williams 2009). The new species does not fit into any known genus, and thus a new genus is erected here in order to accommodate it.

Materials and methods

Specimens were slide mounted and examined under a compound microscope. Descriptions of the body shape of the adult female is described both as unmounted and as mounted on a microscope slide. The body length and width of the adult female was measured in millimeters (mm) as mounted on the slide; other measurements are in microns (µm). Length was measured from the farthest point of the head to the posterior end of the body; width was the greatest width. Description of the adult female of the new species is based on multiple slide-mounted specimens. The number of specimens measured for the description is represented as: n = number of specimens studied. The slide-mounting technique follows that of Williams and Granara de Willink (1992). The material studied is represented by the number of slides and the number of specimens on each slide, e.g., 1(2) means 1 slide with 2 adult specimens. The growth stage and sex of the specimen is listed only for non-adult females. The depository in parentheses is given for each lot of material studied (see abbreviation of depositories below). Each drawing is a generalization of several specimens and was made with the assistance of a *camera lucida* attached to a phase contrast compound microscope. An updated taxonomic key to the adult females of the coccid genera of Myzolecaniinae that occur in the New World was modified from Kondo and Williams (2009).

Abbreviations for the depositories are as follows: Colección de Insectos, Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá D.C., Colombia (UNCB); The National Museum of Natural History, Coccoidea Collection, Beltsville, Maryland, U.S.A. (USNM).

Taxonomy

Key to genera of New World Myzolecaniinae based on adult females
(Adapted from Kondo and Williams 2009)

1. Anal plates located submedially; anterior spiracular pore band incomplete, not extending to margin (posterior spiracular pore band extending to margin); marginal setae cylindrical, peg-like..... ***Cyclolecanium*** **Morrison**
– Anal plates not located submedially, usually found at about 1/5 of body length from posterior margin; anterior spiracular pore band complete, extending to margin or extending as far as posterior spiracular pore band; marginal setae variable, not peg-like..... **2**
2. Stigmatic clefts deep; dorsal sclerotized plates associated with each spiracle.. .....***Cryptostigma*** **Ferris**
– Stigmatic clefts shallow or absent, or rarely deep; without dorsal sclerotized plates associated with each spiracle..... **3**
3. Dorsal microducts around body margin conspicuously larger than rest of microducts on dorsum .....***Octolecanium*** **Kondo**
– Dorsal microducts around body margin not conspicuously larger than rest of microducts on dorsum **4**
4. Large bilocular pores (probably macroducts), present in 1 or 2 small groups anterior to anal plates; marginal setae slender, sharply spinose, with tips mostly pointed, but some with lanceolate, or bifurcate apex, arranged in 1 or 2 rows, numerous (distance between each marginal seta less than half the length of a seta).....***Aztecalecanium*** **Kondo & Williams**
– Groups of large bilocular pores or macroducts absent from area anterior to anal plates; marginal setae variable, arranged in 1 row, not as numerous (distance between each marginal seta more than the length of a seta)..... **5**
6. Preopercular pores absent; dorsum with dense pattern of invaginated bilocular microducts; stigmatic setae absent.....***Pseudophilippia*** **Cockerell**
– Preopercular pores present; dorsal microducts variable, generally without dense pattern of invaginated bilocular microducts; stigmatic setae present, rarely absent..... **8**
8. Ventral tubular ducts absent..... **9**
– Ventral tubular ducts present at least around perivulvar area **10**
9. Dorsum of slide-mounted specimens with a dense pattern of microducts. Young adult females in life covered by a white cottony to powdery wax, although this powdery wax disappears in old specimens. Perivulvar pores mostly with 5 loculi and one central loculus .....***Bombacoccus*** **Kondo**
– Dorsum of slide-mounted specimens without a dense pattern of microducts. Adult females in life covered by a thin layer of glassy wax. Perivulvar pores mostly with 7 or 8 loculi and with 2 or 3 central loculi....***Akermes*** **Cockerell**

10. Ventral tubular ducts present at least in a submarginal band on abdominal region and reaching area around posterior spiracular pore band .... ***Neotoumeyella*** **Kondo & Williams**
– Ventral tubular ducts not distributed as above..... **11**
11. Ventral tubular ducts located around vulva and mediolaterally on abdomen; dorsal setae lanceolate; stigmatic clefts deep .....***Megasaissetia*** **Cockerell**
– Ventral tubular ducts located around vulva and often also on posterior abdominal segments, but absent mediolaterally on abdomen; dorsal setae generally sharply spinose, rarely lanceolate; stigmatic clefts shallow or absent ....***Toumeyella*** **Cockerell**

Bombacoccus **Kondo gen. n.**

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Type species. *Bombacoccus aguacatae* Kondo. By present designation.

Proposed common name. English: Cottony avocado scale. Spanish: Escama blanda algodonosa del aguacate.

Generic description, adult female. Body of adult female convex, young adult females covered by a cottony to powdery white wax; old specimens lacking wax. *Dorsum*. Derm membranous but becoming heavily sclerotized at maturity. Dorsal tubercles absent. Body setae sharply spinose, straight or with bent tips. Preopercular pores oval in shape, convex, present in a group anterior to anal plates and extending onto mid-dorsum. Simple pores present. Dorsal microducts present, with well-developed septa, and a long terminal filament, distributed evenly throughout dorsum. Anal plates with 5 or 6 apical setae, with about 4 subapical setae, 2 fringe and 12 hypopygial setae. Anal ring with 10 setae. In older specimens, a sclerotized area about half the width or less of the anal plates is formed around anal plates. Anal ring with 10 setae, translucent pores in 2 irregular rows. *Margin*. Marginal setae sharply spinose, straight or with bent tips. Stigmatic spines totaling 3; median spine often longest. Eyespots not detected. *Venter*. Ventral derm membranous. Ventral body setae sharply spinose, with 3 pairs of long prevulvar setae. Submarginal setae in one row, similar to rest of ventral body setae. Interantennal setae totaling 6. Antennae reduced, each 4–6 segmented. Mouthparts well developed; labium with 4 pairs of setae. Legs all reduced; prothoracic legs generally shortest. Tarsal digitules each pointed; claw digitules each knobbed; claw without a denticle. Spiracles large, posterior spiracle largest and larger than hind leg. Spiracular pores with 5 loculi; each pore band broad, reaching margins. Tubular ducts absent. Perivulvar pores with 5 loculi, present in a small group on each side of anal lobes present ventrad to anal plates. Ventral microducts abundant, scattered throughout venter.

Diagnosis. *Bombacoccus* gen. n. is closest to *Akermes* Cockerell but the two genera can be separated by the following combination of features (morphological features of *Akermes* in parentheses): (i) dorsum with a dense pattern of microducts (dorsum without a dense pattern of microducts); (ii) young insects in life covered by a white cottony

or powdery wax (young insects in life not covered by a white cottony or powdery wax); and (iii) perivulvar pores mostly quinquelocular, with one central loculus (perivulvar pores variable, with 7 or 8 loculi, with 2 or 3 central loculi). Character states of *Akermes* taken from Granara de Willink (1999).

Etymology. The new genus *Bombacoccus* is formed by the combination of the Medieval Latin word "*bombax*" meaning cotton and the Latin word "*coccus*" meaning a berry, and commonly used as an ending of scale insect names.

***Bombacoccus aguacatae* Kondo, sp. n.**
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Figs 1, 2

Description, adult female (measurements based on n=18). **Insects in life.** Dorsum of young adult females covered by a white cottony wax, with a broad marginal fringe of cottony wax. The cottony wax is gradually replaced by a powdery white wax in older specimens (Fig. 1A–E), and eventually the wax completely wears out. Insect after removal of wax, yellow-green to greenish brown in color, but older specimens becoming dark brown.

Mounted material. Adult female, oval to elongate oval in outline, 4.2–10.0 mm long, 3.8–8.2 mm wide.

Dorsum. Derm membranous, becoming sclerotized in old specimens. Body setae sharply spinose, straight or slightly bent, each 12.5–20.0 µm long, scattered over dorsum, but abundant on mid-dorsum on area anterior to anal plates. Simple pores each 5.0–6.0 µm wide. Preopercular pores oval in shape, each 6.3–12.5 µm wide, convex, present in a large group anterior to anal plates and extending onto mid-dorsum. Dorsal microducts each 5.0 µm wide, evenly distributed throughout dorsum, densely distributed particularly in younger specimens, but less dense in older specimens due to dilation of derm. Anal plates each triangular in shape, located at about 1/4 of body length from posterior margin, each plate 240–265 µm long, 125–150 µm wide, anterolateral margin 160–175 µm long, posterolateral margin 165–200 µm long. Each plate with 5–7 dorsal apical setae, about 4 ventral subapical setae, 2 fringe setae and 12 hypopygial setae. In older specimens, a sclerotized area about half the width of the anal plates or wider is formed around the anal plates. Anal ring with 10 setae, translucent pores in 2 irregular rows. *Margin*. Marginal setae sharply spinose, straight or with bent tips, each 22.5–42.5 µm long, arranged in an irregular single row around body margin, with 9–14 marginal setae between anterior and posterior stigmatic spines. Stigmatic spines totaling 3; median spine each 22.5–37.5 µm long, lateral spines each 15.0–32.5 µm long; median seta often longest. Eyespots not detected. *Venter*. Ventral derm membranous. Ventral body setae sharply spinose, each 12.5–22.5 µm long, with 3 pairs of long prevulvar setae, each 50–100 µm long. Submarginal setae in one row, similar to rest of ventral body setae. Interantennal setae totaling 6. Antennae reduced, total length 120–230 µm long, each 4–6 segmented. Clypeolabral shield 295–340 µm wide; labium

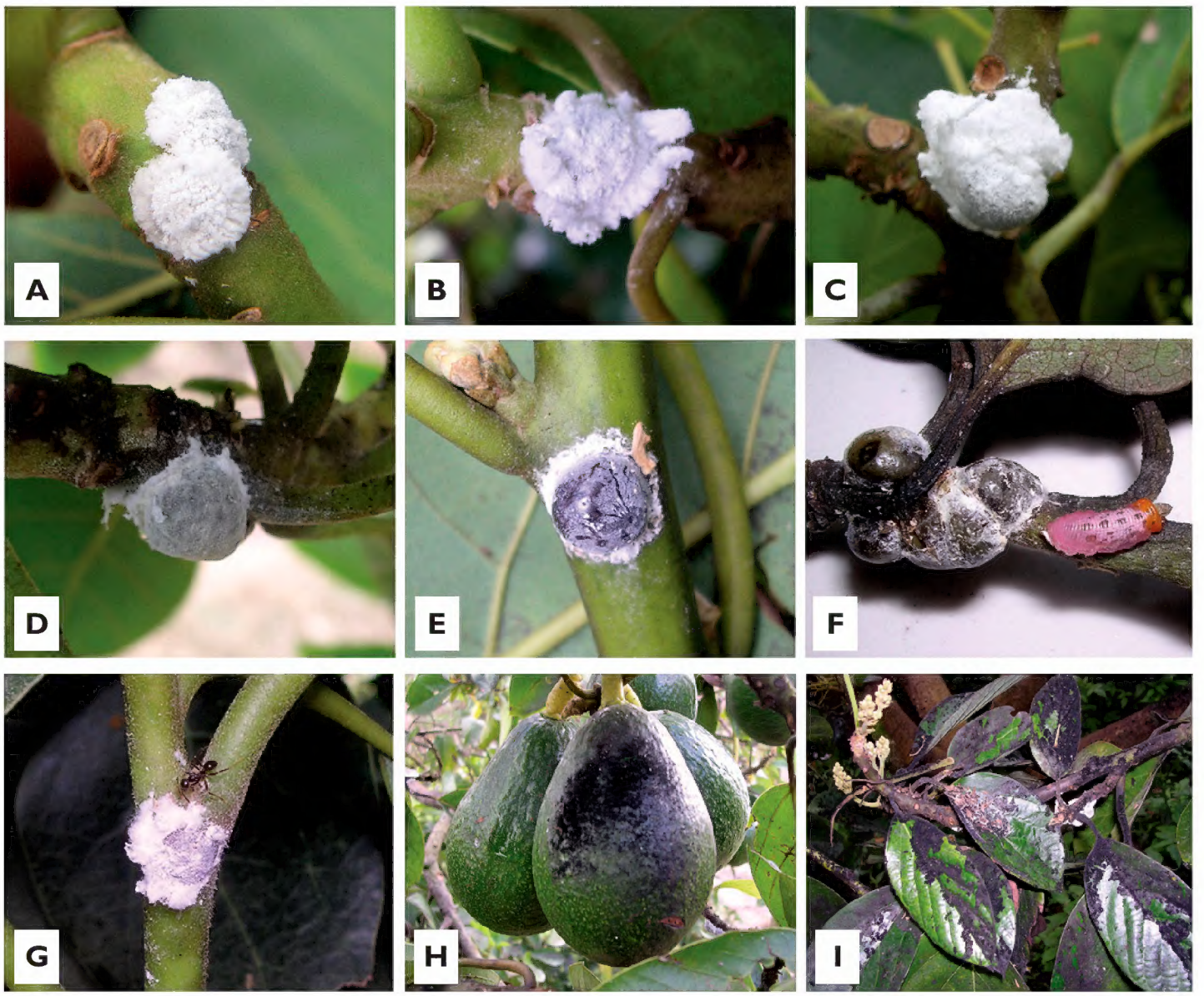
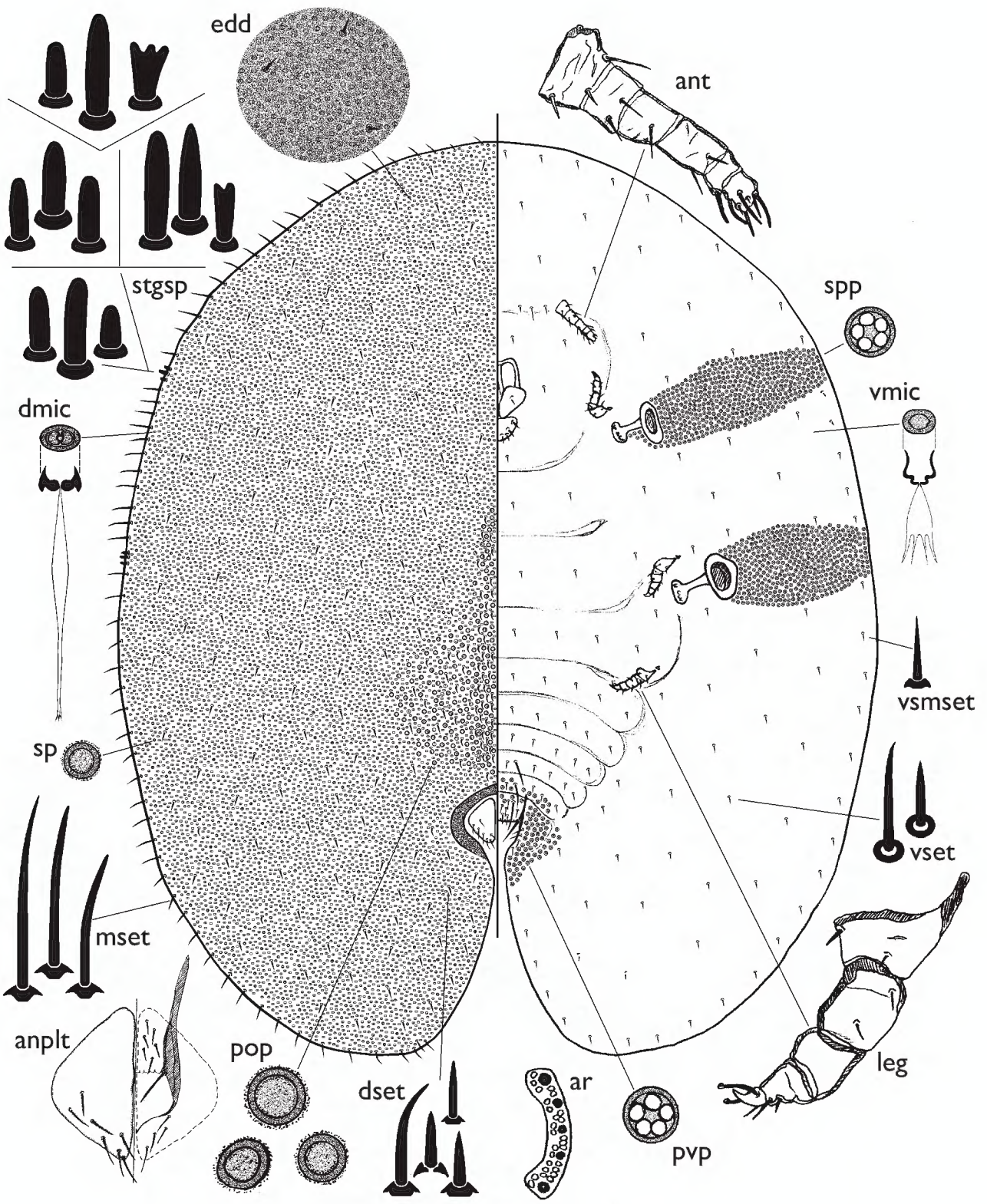


Figure 1. *Bombacoccus aguacatae* Kondo, sp. n. **A** Young adult female **B, C** Older adult female with cottony wax **D** Older adult female with powdery wax **E** Old adult female beginning to lose its wax **F** Left. Old adult females. Right. Larva of a predatory syrphid fly **G** Adult female being visited by *Pheidole* sp. ant **H** Sooty mould on an avocado fruit **I** Sooty mould on leaves of avocado plant. Photo 1.A by A.A. Ramos-Portilla; Photos 1.B–I by T. Kondo.

with 4 pairs of setae. Legs reduced: total length 160–275 µm long; prothoracic legs generally shortest. Tarsal digitules each pointed; claw digitules knobbed; claw without a denticle. Spiracles large, anterior peritreme each 150–240 µm wide, posterior peritreme each 175–275 µm wide. Spiracular pores with 5 loculi, each 6.0–7.0 µm wide; spiracular pore band about same width as peritreme but widening medially, each pore band reaching margins. Tubular ducts absent. Perivulvar pores with 5 loculi, each pore 7.0–8.0 µm wide, abundant, present ventrad to anal plates. Ventral microducts each with duct rim 4.0 µm wide, fairly abundant, scattered throughout venter.

Biology. The insects were found on the tree branches and twigs of avocados of two varieties. Tiny parasitic wasps have been found to emerge from the body of old females and a species of syrphid fly (Diptera: Syrphidae) larvae have been found feeding on the coccid nymphs (Fig. 1F). Insects were observed being tended by *Pheidole* ants (Fig. 1G). Sooty moulds regularly grow on their excreted honeydew covering the branches, leaves and fruit (Figs 1H and I).



Bombacoccus aguacatae Kondo, young adult female

Figure 2. *Bombacoccus aguacatae* Kondo, sp. n., adult female. **anplt** = anal plate; **ant** = antenna; **ar** = anal ring; **dmic** = dorsal microduct; **dset** = dorsal setae; **edd** = enlargement of dorsal derm; **mset** = marginal setae; **pvp** = perivulvar pore; **pop** = preopercular pore; **sp** = simple pore; **spp** = spiracular pore; **stgsp** = stigmatic spine; **vmic** = ventral microduct; **vset** = ventral setae.

Distribution. Neotropical region. Colombia.

Host plants. Lauraceae: *Persea americana* Mill. Collected on the varieties Booth 8 and Hass.

Material studied. Holotype: Colombia, Caldas, Anserma, vereda Palo Blanco, Finca Yarumalito, 05°14'36.5"N, 75°45'46.2"W, 1910 m asl, 2.iv.2009, coll. T. Kon-

do, ex *Persea americana*, var. Booth 8, adult ♀, 1(1) (UNCB). **Paratypes:** same data as holotype, 16(16: 9 adult females + 2 second-instars + 21 first-instar nymphs) (USNM); same data as Holotype, but on *P. americana*, var. Hass, 27 slides (8 adult females + 16 third-instar nymphs + 5 second-instar nymphs + 2 first-instar nymphs).

Notes. *Bombacoccus aguacatae* sp. n. is the only known soft scale insect (family Coccidae) in Colombia with a dorsum covered in a white cottony or powdery wax. Most soft scales of the *Toumeyella*-group are covered by a thin layer of wax; however, a few species in North America are also covered either by a cottony wax, e.g., *Pseudophilippia quaintancii* Cockerell which occurs in the eastern USA and is covered by a profusion of fluffy, snow white wax (Hamon and Williams 1984); *Neolecanium cornuparvum* (Thro), also occurring in the eastern USA, which ie usually covered in a white bloom or mealy wax (Hamon and Williams 1984); and one other species from Mexico, *Neotoumeyella leucaenae* (Cockerell) which has been reported to be somewhat covered with small patches of dull white waxy secretion (Cockerell 1903). *Bombacoccus aguacatae* can be easily separated from *P. quaintancii* by the following features (morphological features of *P. quaintancii* in parentheses): (i) preopercular pores present (absent); (ii) dorsal microducts not invaginated (invaginated); and (iii) stigmatic setae present (absent). *Bombacoccus aguacatae* resembles also *N. cornuparvum* and *N. leucaenae*, however, *B. aguacatae* can be easily separated from these two species by the presence of ventral tubular ducts in the perivulvar region of *N. cornuparvum* and *N. leucaenae*, whereas *Bombacoccus aguacatae* completely lacks ventral tubular ducts.

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